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RECOVERY POTENTIAL ASSESSMENT FOR SEA OTTERS (*Enhydra lutris*)

Sea Otter (Enhydra lutris) B. Gisborne

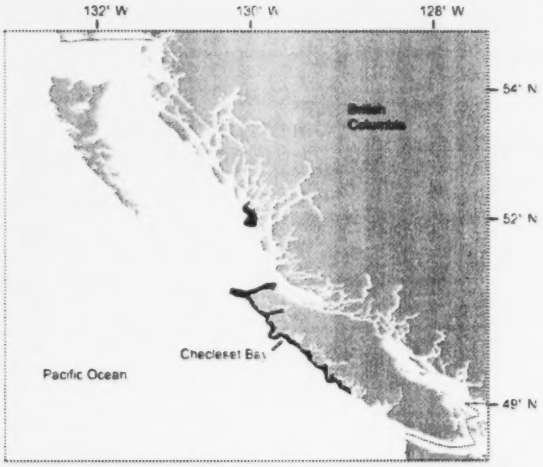

Figure 1: The range of the sea otter in Canada indicated in black.

Context :

Sea otters were listed as Threatened in 1996 by COSEWIC (down-listed from Endangered, a designation given in 1978) because of a small population size and a limited distribution. A Recovery Strategy and Action Plan have been drafted. Sea otters are presently under review by COSEWIC and their assessment decision is pending. The RPA is intended to further guide and assist the development of the strategy and to help guide future management of the species in Canada.

SUMMARY

- Sea otter populations throughout their range in the North Pacific were driven to the brink of extinction by the maritime fur trade during the 18th and 19th centuries. In Canada the species was finally extirpated from British Columbia by 1929.
- To reintroduce the species to Canada, 89 sea otters from Alaska were released into Checleset Bay, west coast Vancouver Island, in 1969, 1970 and1972.
- The most recent population estimate, from 2001, indicates a minimum population of 3,180 sea otters in Canada.
- The population occurs in two areas of the west coast. Most animals (2,673) occur along the west coast of Vancouver Island, with the remainder occupying a small section of the central British Columbia coast.
- Population growth along the west coast of Vancouver Island averaged 19.1% per year from 1977 to 1995, but appears to have slowed to 8.0% per year since 1995. Growth

may have slowed because some areas near the centre of the range have reached equilibrium. On the central B.C. coast, growth has average 12.4% per year between 1990 and 2004.

- Maximum or carrying capacity population estimates for British Columbia suggest that at its current size, the population is below coast wide carrying capacity. The population likely occupies 25 to 33% of its historic range in British Columbia.
- Habitat is not limiting for the species in Canada at present population level; however, further evaluation would be needed to assess any components that could qualify as *critical habitat* as defined by SARA.
- A recommended interim recovery target for sea otters in Canada is to continue the geographic range expansion and growth of the population.
- Total allowable human-induced mortality, calculated as Potential Biological Removal for the Canadian sea otter population was estimated to be 143 sea otters per year.
- Should a directed take be considered, it should be geographically distributed and carried out in such a way so as not to constrain achievement of the recovery target. Sea otters are a polygynous species hence mortality of females will have a greater effect on the population than male mortality and this factor should also be considered.
- Oil spills continue to represent a significant threat to the population. Illegal killing does occur and may be of concern. Other potential threats are also identified.

BACKGROUND

Rationale for Assessment

The sea otter was listed as Threatened in Canada by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in 1996 (down-listed from Endangered, designated in 1978), because of a small population and a limited distribution. In 2006 a new status report was prepared and with this, COSEWIC is now re-assessing the status of the species. As required under the Species at Risk Act (SARA), a Recovery Strategy (2003) and a Recovery Action Plan were drafted to guide recovery of the sea otter in Canada. At the time these documents were developed, neither recovery potential nor allowable harm assessments were included.

Species Biology

The sea otter, *Enhydra lutris*, is the only member of the genus *Enhydra*. Three subspecies are recognized, and *Enhydra lutris kenyoni*, which ranged historically from Oregon to the Aleutian Islands, is the subspecies now occurring in British Columbia. Unlike other marine mammals, sea otters have little body fat to provide insulation. Instead they maintain an exceptionally high metabolic rate and rely on a layer of air trapped in their dense fur for insulation. Sea otters groom frequently to maintain the integrity of their fur and its ability to hold a layer of air.

Sea otters are sexually dimorphic. Adult males can reach weights of 50kg and lengths of 150cm, whereas adult females can grow to 36kg and reach lengths of 140cm. At birth, pups weigh 1.7-2.3 kg and are up to 60cm in total length. Females attain sexual maturity by 2 to 5 years. Males reproduce at 5 to 6 years of age, although they may be sexually mature earlier.

Females have a higher survival rate than males and live 15 to 20 years, compared to 10 to 15 years for males. Although mating and pupping can occur year-round, distinct peaks in pupping in spring are noted in some populations including British Columbia. Sea otters are polygynous, with males forming pair bonds consecutively with several females. Females produce a single pup at approximately 1-year intervals and the pup remains dependent on its mother for 5 to 8 months.

Sea otters are non migratory and exhibit considerable site fidelity, although seasonal movements and occasional long distance movements of individuals may occur. Sea otters occupy relatively small overlapping home ranges varying in size from a few to 10s of kilometres of coastline. Within their home ranges, sea otters aggregate to rest in floating groups, called rafts, which can include over 100 individuals. Sea otters tend to segregate by sex such that there are male rafts and female rafts that occupy spatially separate areas.

Maritime Fur Trade

Throughout its range along the Pacific rim from Baja California, Mexico to northern Japan, the sea otter was driven almost to extinction as a result of the intense maritime fur trade by American, Russian and European traders with aboriginal peoples that commenced in the mid 1700s and continued through the 1850s. Crude estimates of the pre-exploitation population size range from 150,000 to 300,000 animals. By 1911 the total sea otter population in the North Pacific is thought to have been reduced to less than 2% of its pre-exploitation size. In Canada, the species was extirpated by 1929 as a result of continued opportunistic hunting, probably driven by the market value of pelts.

Ecological Role

The sea otter is a nearshore species feeding primarily on benthic invertebrates and is recognized as a keystone species contributing significantly to the structure and function of nearshore benthic communities and upon the life history of their invertebrate prey. Sea otters can be expected to reduce abundance and size of their invertebrate prey species yet there is no evidence that recovering sea otter populations will or have caused extirpation of any invertebrate species.

By foraging on herbivorous invertebrates, particularly sea urchins, sea otters reduce grazing pressure which allows greater growth of kelp. Thus the presence of sea otters alters the community from one dominated by grazers with little kelp to one that supports kelp and invertebrates as well as a greater abundance and diversity of fish species. Research in the Aleutian Islands indicates that such systems are up to 2 to 3 times more productive than systems without sea otters because of the kelp-derived carbon.

ASSESSMENT

Population Status and Trajectory

In an effort to re-establish the species in Canada, 89 sea otters were reintroduced in three translocation efforts to Checleset Bay, Vancouver Island from Alaska in 1969, 1970 and 1972. Estimates of sea otter abundance and occupied range in British Columbia have been obtained by small boat, helicopter or fixed-wing aircraft since 1977. These surveys are direct counts of sea otters and provide minimum population estimates and trends in growth. In 2001, 2,673

otters were counted along the Vancouver Island coast and 507 on the central British Columbia coast for a total of 3,180 otters. Surveys made in 2002, 2003 and 2004 resulted in similar counts, suggesting little growth in the population since 2001. On Vancouver Island, the population growth rate averaged 15.6% per year (1977 to 2004) based on a simple log-linear regression of counts but a piece-wise regression which allows for an inflection in the log-linear trend showed that the initial rapid growth of 19.1% per year from 1977 to 1995 (near physiological maximum) may have slowed to 8.0% per year from 1995 to 2004. This decline in the growth rate likely reflects parts of the population near the centre of the range along Vancouver Island reaching equilibrium densities. On the central British Columbia coast, the population growth rate averaged 12.4% per year between 1990 and 2004, a rate that seems low given the amount of unoccupied habitat available. There may be greater inter-survey variability obscuring the trend and/or higher mortality affecting population on the central British Columbia coast.

Since reintroduction to Checleset Bay, the sea otter population has grown and the range of occupation increased southward and northward along the west coast of Vancouver Island. Sea otters were first reported on the central British Columbia coast in 1989 and were first surveyed there in 1990, at which time the minimum estimate was 56 sea otters. The central British Columbia coast sea otters appear to be descendents of the reintroduced otters and their appearance on the central coast likely reflects early movements of the released otters rather than natural range expansion subsequent to otters becoming re-established on Vancouver Island. Figure 1 shows the occupied range in British Columbia as of 2004.

Range expansion and sea otter population growth are inter-related. Range expansion occurs when occupied areas near equilibrium density and males move *en masse* from the periphery of the occupied range into adjacent habitat. Therefore population growth can be expected to result in range expansion from the areas of occupation when those areas approach carrying capacity.

Estimates of sea otter carrying capacity for the British Columbia coast have been made using a habitat approach in which carrying capacity is estimated for the current range in British Columbia as well as for habitat that is as yet unoccupied. Based on a model to identify habitat similar to Checleset Bay, carrying capacity was estimated to be 14,844 sea otters, (95% confidence intervals 9,798 – 20,769). This estimate is low, however, given the historical accounts from the maritime fur trade and suggests that there are other types of habitat suitable for sea otters not captured by the model. An alternate estimate, based on otters per kilometre of shoreline, was 52,199 (95% confidence interval, 48,672-59,018). The most recent population estimate of 3,180 sea otters is well below either of these coast wide carrying capacity estimates.

Critical Habitat

The seaward extent of sea otter habitat is largely limited by their ability to dive to the sea floor for food. Most foraging dives occur in depths of 40m or less, although sea otters are capable of diving to 100m. Thus their habitat is typically within 1 to 2km of shore unless areas of extensive shallows extend further. When present, kelp beds are often used habitually as rafting sites. Kelp beds are also used for foraging and are important, though not essential, habitat components. Sea otters prey upon a wide variety of invertebrate species and both rocky and soft bottom communities provide foraging habitat.

In British Columbia, sea otters occupy exposed coastal areas with extensive rocky reefs and associated shallow depths along the west coast of Vancouver Island and the central British Columbia coast. As the range expands, the characteristics of the habitat used by sea otters are likely to become more diverse. Habitat is not limiting for this population but further evaluation

would be needed to assess any components that could qualify as *critical habitat* as defined by SARA.

The concept of a residence as defined in SARA is unlikely to be applicable to sea otters.

Population and Distribution Recovery Target

Sea otter distribution and abundance are highly inter-related because unoccupied habitat is sequentially occupied only as the number of otters in neighbouring areas approaches carrying capacity. Sea otters are relatively sedentary. Thus, an increase in the geographic range of the species is expected to result in a larger population with a reduced risk of extinction due to human-induced mortality. Therefore, an interim recovery target for sea otters on the British Columbia coast is to continue the geographic range expansion of the species.

Recovery Potential and Time frame to Recovery

Given the amount of available habitat, sea otters in British Columbia have good potential to recover in Canada. The population has taken approximately 30 years since reintroduction of 89 otters to Checleset Bay on Vancouver Island, to occupy the current range on Vancouver Island and the central British Columbia coast. The occupied range is now likely about 25 to 33% of the historical range. In the absence of quantitative recovery targets, it is not possible to estimate a time frame to recovery.

Allowable Harm

The Potential Biological Removal (PBR) method was used to estimate a limit for all sources of human induced mortality. For the calculation of PBR the following parameters and values were used:

N_{MIN} = 3,180; the population estimate from 2001.
R_{MAX} = 0.18; the annual growth rate for the period 1987 to 1995 on Vancouver Island,
F_R = 0.5; the recommended recovery factor.

$PBR = N_{MIN} \times \frac{1}{2} R_{MAX} \times F_R$

PBR for sea otters in Canada is calculated to be 143 otters per year.

PBR value represents allowable harm from all sources of human-induced mortality. The establishment of a harvest level based on this value would need to take into account harm levels from other sources of human-induced mortality. Further since sea otters are polygynous, consideration should be made for the fact that mortality of females will have a greater impact on the population than male mortality. Any directed take should also be distributed geographically so as to minimize impact to the population and the recovery target.

Threats

Oil Spills

Oil is a significant threat to sea otters in all populations. Oil destroys the water-repellent nature of the pelage which eliminates the air layer and reduces insulation by 70%, resulting in

hypothermia and, if the quantity of oil is sufficient, death. Methods for cleaning and rehabilitating sea otters exist, but they are costly and the benefits at a population level have been questioned.

Several behavioural characteristics predispose sea otters to oil exposure. Sea otters typically rest in sexually-segregated aggregations (rafts) of up to 200 animals, so large numbers of otters can be exposed simultaneously. In addition, rafts of otters often form in or near kelp beds, which accumulate and retain oil. Once fouled, a sea otter grooms itself obsessively and stops feeding or resting, exacerbating the hypothermia. Oil and fumes may be ingested or inhaled, possibly damaging internal organs. Finally, otters may be chronically exposed to oil, through foraging in areas that harbor residual oil or ingesting contaminated prey, long after the spill has occurred.

Risk models for southern British Columbia and Washington State, developed in the 1980s, predict that spills of petroleum product in excess of 159,000 litres could be expected every 1.3 years, and the actual frequency of large spills affecting British Columbia between 1974 and 1991 was close to the predicted number. The *Nestucca* oil spill in 1988, which spread oil along the British Columbia coast, demonstrated the vulnerability of the Canadian sea otter population to oil spills. Long-term studies of sea otters in Prince William Sound, Alaska following the *Exxon Valdez* oil spill of 1989 demonstrates that full recovery of an injured sea otter population can be a slow process, and in the case of EVOS, take several decades.

Illegal Killing

Verified reports of 5 skinned and shot carcasses in 2005 and 2006 indicate that illegal killing does occur in British Columbia. The magnitude of this activity is unknown.

Other Threats

Although oil spills and illegal killing are the two primary threats, additional concerns are recognized in other sea otter populations. These threats should be considered as potential threats that may affect sea otters in Canada, ones that may emerge as impacts in the future as the range expands. These are: environmental contaminants (other than oil), entanglement in fishing gear, vessel strikes, and disease introduced through anthropogenic activities.

Sources of uncertainty

Estimates of coast-wide sea otter carrying capacity varied widely. Each was derived using different habitat models that make different assumptions about habitat and neither can be tested coast wide against empirical data at this time. The historical records from the maritime fur trade, though not a means of testing these models, indicate the magnitude of the historical trade and the sea otter population that supported it and suggest that the estimate of 14,844 is far too low.

Sea otter population size and range currently are documented by direct counts. These provide minimum estimates of population size. The proportion of missed animals is not estimated but is assumed to be relatively constant among survey years. However, if the proportion of missed animals is not constant, this could affect the estimated maximum growth rate which is a parameter in the Potential Biological Removal calculation. However, the population growth rate observed on Vancouver Island (used in PBR calculation) is consistent with the estimated growth observed in other reintroduced populations during the early years following successful establishment. There is much less certainty about the growth trajectory of the sea otters on the central British Columbia coast, where the rate of 12.4% per year (1990 to 2004) seems low for a population with ample amounts of unoccupied habitat.

CONCLUSIONS AND ADVICE

The sea otter population continues to show a positive growth trend and exhibit range expansion. Range expansion and population growth are inter-related in this species. Continued expansion of the geographic range will reduce the risk from human induced mortality, and should occur as areas currently occupied approach carrying capacity.

Sea otters presently occupy exposed coastal areas with extensive rocky reefs and associated shallow depths along the west coast of Vancouver Island and the central British Columbia coast. However, as the range expands, the variety of habitat types occupied will likely increase. At present habitat is not limiting for this population but further evaluation would be needed to assess any components that could qualify as *critical habitat* as defined by SARA.

A limit to total human induced mortality was estimated using the Potential Biological Removal method. Sea otters are polygynous, hence mortality of females will have a greater impact on the population than mortality of males. If a directed take is considered, this factor should be taken into account. Further any take should also be distributed spatially and temporally so as not to impede achievement of recovery targets. Any directed take would also need to take into account other potential sources of mortality.

Oil spills remain a significant threat to the species and their habitat in Canada. As the population continues to grow and the occupied range expands, the population level risk from an oil spill should diminish. Illegal killing does occur and may be a threat. Other potential threats include other environmental contaminants, entanglement in fishing gear, vessel strikes and disease.

SOURCES OF INFORMATION

Nichol, L.M., 2007. Recovery potential assessment for sea otters (*Enhydra lutris*) in Canada. DFO Can. Sci. Advis. Sec. Res. Doc. 2007/034.

FOR MORE INFORMATION

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